5/16/16 "The best way to predict the future is to create it." -Peter Drucker

HW: "Introduction to Probability" Homework section #1-4

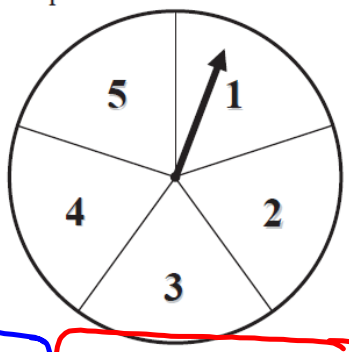
AIM: What is Probability?

Warm Up:

BASIC PROBABILITY TERMINOLOGY

1. **Experiment:** Some process that occurs with well defined outcomes.
2. **Outcome:** A result from a single **trial** of the experiment.
3. **Event:** A collection of one or more outcomes.
4. **Sample Space:** A collection of all of the outcomes of an experiment.

***Exercise* #1:** An experiment is run whereby a spinner is spun around a circle with 5 equal sectors that have been marked off as shown.



(a) What is the **experiment**?

Spinning the spinner.

(b) Give one outcome of the experiment.

Landing on 1

(c) What is the probability of spinning the spinner and landing on an odd number? What is the event here? What outcomes fall into the event?

1, 3, 5

$\frac{3}{5}$ or .6 or 60% chance

Landing on an odd #

what you want / ALL outcomes

THE BASIC DEFINITION OF PROBABILITY

The probability of an event E occurring is given by the ratio: $P(E) = \frac{n(E)}{n(S)}$, where:

$n(E)$ is the number of outcomes that fall into the event E

$n(S)$ is the number of outcomes that fall into the sample space

# of outcomes that satisfy the event

# of total possible outcomes

***Exercise* #2:** Given the above definition, between what two numbers must ALL probabilities lie? Explain.

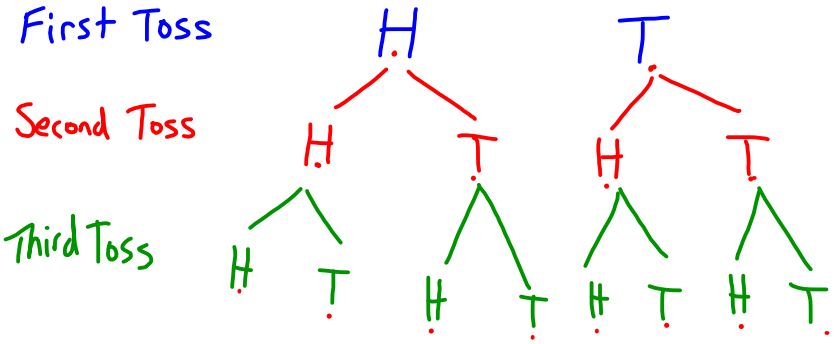
$0 \leq \text{Probability} \leq 1$

$0\% \leq P \leq 100\%$

When we deal with **theoretical probability** we don't actually have to run the experiment to determine the probability of an event. We simply have to know the number of outcomes in the sample space and the number of outcomes that fall into our event. Let's take a look at a slightly more challenging scenario.

***Exercise* #3:** A fair coin is flipped three times and the result is noted each time. The sample space consists of **ordered triples** such as (H, H, T), which would represent a head on the first toss, a head on the second toss, and a tail on the third toss.

(a) Draw a **tree diagram** to show all of the different outcomes in the sample space.



(b) List all of the outcomes as ordered triples. How many of them are there?

(HHH) (THT) (HHT) (HTT)
(TTT) (TTH) (HTH) (THH)

8 Total

(c) Find each of the following probabilities based on your answers from (a) and (b):

(i) $P(\text{all heads})$

$\frac{1}{8}$

(ii) $P(\text{exactly 2 heads})$

$\frac{3}{8}$

(iii) $P(\text{all heads or all tails})$

add

$\frac{1}{8} + \frac{1}{8}$

$\frac{2}{8} = \frac{1}{4}$

Sometimes we have to quantify chance by using observations that have been made in the real-world. In this case we talk about **empirical probability**. The fundamental equation for probability still stands.

***Exercise* #4:** A survey was done by a marketing company to determine which of three sodas was preferred by people in a blind taste test. The results are shown below.

Soda	Number who Preferred
A	18
B	24
C	11
Total	53

(a) Find the empirical probability that a person selected at random from this group would prefer soda B. Express your answer as a fraction and as a decimal accurate to two decimal places (the standard).

$\frac{24}{53} = .45 = 45\%$

(b) Find the empirical probability that a person selected at random from this group would *not* prefer soda A. Again, express your answer as a fraction and as a decimal accurate to two decimal places.

Then they prefer B or C

$\frac{24}{53} \oplus \frac{11}{53} = \frac{35}{53} = .66 = 66\%$